

Nutritional status, Vitamin B12 level, physical performance and disabilities in the elderly

Ghufran Bayan Abd-Ali¹, Waleed Ibraheem Ali²

¹A trainee in fellowship of clinical nutrition, Baghdad medical city/Iraq

²intensivists at Ghazi Al-Hariri hospital, Baghdad medical city/Iraq

Email: ghufranbayan@yahoo.com

Email: waleedali914@gmail.com

Abstract

Background: Nutritional need throughout life is not static and changes associated with nutritional requirement of the elderly may be related to many factors like; normal aging processes, medical conditions, psychological and physical factors, or lifestyles and functional incapability. The prevalence of low B12 level increases with age. Along with hematological, neuropsychological, and cardiovascular diseases, B12 deficiency has been associated with myeloneuropathy, optic neuropathy, peripheral neuropathy, and weakness in lower extremities. Aim of study: The projected study aims to assess the effects of vitamin B12 level and nutritional status on the physical performance and functional status of elderly peoples visiting geriatric care clinic at Baghdad medical city. Subjects and Method: Across sectional study was conducted on elderly people visiting geriatric care clinic in Baghdad teaching hospital at Baghdad medical city/Iraq. Participants from age 60 years and above had been recruited for the study and selected by a convenient sampling technique. We used a pre-tested questionnaire form, B12 level measurement, Mini-Nutritional Assessment Score, the short physical performance battery, six-minute walking test and investigating activities of daily living. Results: A total of 100 geriatric participants included in the study, the prevalence of low B12 level is 35% expressed some degree of limitation in physical performance and difficulties in performing instrumental activities of daily living while the prevalence of limited physical performance is 54% among malnourished and those with at risk of malnutrition in addition to significance in association with basic and instrumental activities of daily living. Conclusion In this study we found

1. significant association between poor nutritional status and poor physical performance.
2. statistical association of nutritional status with functioning (both basic and instrumental activities of daily living show significant association).
3. significant association of B12 level and physical performance.
4. Statistical relationship of B12 level with instrumental activity of daily living but with basic activities of daily living show insignificant relationship.

Keywords: geriatric, nutrition, vitamin B12, performance.

1. Introduction

Aging is a complex process with changes in physiological, psychological and social factors that may impact on nutritional status⁽¹⁾. Nutritional need throughout life is not static and changes associated with nutritional requirement of the elderly may be related to many factors like, normal aging processes, medical conditions, psychological and physical factors, or lifestyles and functional incapability. Among the elderly, various personal and environmental factors can affect the nutritional status. Also multifaceted interaction of personal and environmental factors of this group of people has been found to have a significant effect on their nutritional status and overall well-being⁽²⁾. The nutrition and health of old peoples is often neglected. Most programs regarding nutritional intervention are directed toward infants, children, adolescents, pregnant and lactating mothers. However, nutritional interventions could play a part in the prevention of degenerative conditions of the elderly and improving quality of life. A timely intervention can stop weight loss in those at risk of malnutrition⁽³⁾.

Nutritional status is important for the creation of a database to assist with the initiation of important programs and formulation of policies⁽³⁾.

In old age, adequate nutrient intake is very essential for achieving and maintaining sound health, fight and recover from diseases and infections as well as leading a healthy life but this may be difficult to achieve among the elderly, especially those that enjoy no or little care. Similarly, difficulties in performing various basic activities of daily living (BADL) and instrumental activities of daily living (IADL) may make an elderly to be prone to malnutrition and this will in turn affect the health and quality of life of not only the elderly but also of the relatives and healthcare providers⁽²⁾.

Vitamin B12 deficiency affects 5%–20% of older adults, while up to 40% have low B12 levels. The prevalence of low B12 level increases with age. B12 deficiency can lead to myelin damage as a result of deficient methylation of myelin basic protein. Along with hematological, neuropsychological, and cardiovascular diseases, B12 deficiency has been associated with myeloneuropathy, optic neuropathy, peripheral neuropathy, loss of sensation in peripheral nerves, and weakness in lower

extremities⁽⁴⁾.

To our knowledge, there is no previous comparative study about nutritional status, B12 level with physical performance and disability in Iraq. So, it is important to catch the comparison that not effecting the health only, but also their social interaction and economic burden. Of their life.

2. Patient and Methods

Study design, target population and setting: a comparative cross-sectional study was conducted on geriatric care clinic at Baghdad teaching hospital in Baghdad medical city.

Study time: the study started at April, throughout November 2022.

Inclusion criteria: patients from both genders aging 60 years and over visiting geriatric care clinic.

Exclusion criteria: patients with severe impairment in cognitive function and patients on chair-wheel.

Sampling technique: peoples from geriatric care clinic had been recruited for the study and selected by a convenient sampling technique.

Sample size: A total of 100 patients out of 175 agreed to participate in the study.

Data collection: The data were collected in three times per month during a period from first of April to 30th of May 2022. We use questionnaire form that consist of the following:

Part 1: sociodemographic information, consisting of age, sex, marital status, schooling, working, smoking, alcohol intake, morbidities, dietary habit, gastric and intestinal surgery, intestinal diseases and drugs intake, all were obtained from direct questioning while weight, height were measured with participants wearing light clothes and without shoes. Body mass index (BMI) was computed as weight (kilogram) divided by squared height (meter).

Part 2: vitamin B12 level measurement classified according to reference ranges less than 173pg/ml as below normal, 173-700pg/ml as normal range and above 700pg/ml above normal value, we provide information about biochemical classification of B12 level according to instruments used in our scientific laboratory. Mini-Nutritional Assessment score (MNA) used to assess nutritional status as (24-30) normal nutritional status, (17-23.5) at risk of malnutrition and less than 17 malnourished. (MNA) is one of the most valid and comprehensive tools for assessing geriatric nutritional status⁽⁵⁾.

Part 3: the short physical performance battery (SPPB) and six-minute walking test (6MWT) used together for measuring participants' physical performance which ranked as (more than 12) no limitation, (10-12) minimal limitation, (7-9) mild limitation, (4-6) moderate limitation and (0-3) sever limitation. While investigating disabilities by evaluating participants' self-reported difficulty in performing one or more basic activities of daily living (BADL), and instrumental activities of daily living (IADL)⁽⁶⁾.

Ethical issue: before data collection, official

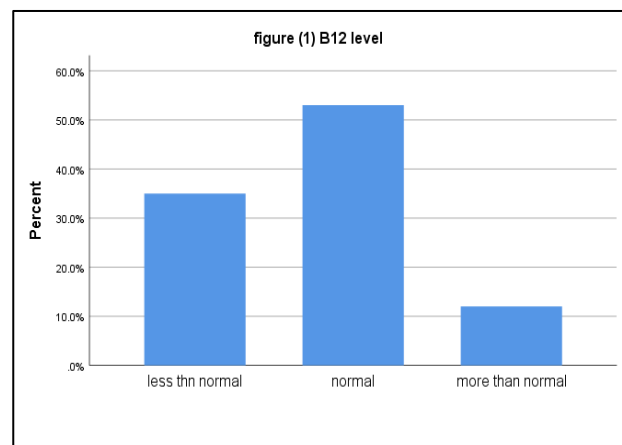
agreement had been taken, official agreement had been taken from Arabic council of medical specialty. Also, official agreement from geriatric care clinic in Baghdad teaching hospital and teaching laboratories in Baghdad medical city had been obtained. Verbal consent was obtained from every participant after explaining the aim and objectives of study and ensuring privacy of data and questionnaire filled without names.

3. Statistical Analysis

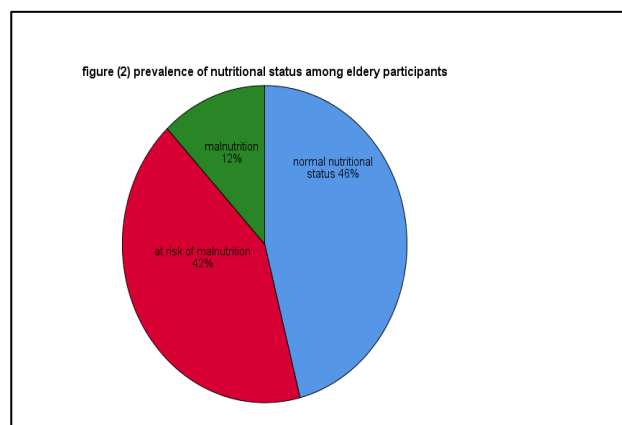
data were entered and statistical analysis conducted by using SPSS program version 25. Data were presented in form of tables, numbers and percentages. Descriptive statistics (standard deviation and percentages) used for summarizing the study and outcome variables. Chi-square test (χ^2 -test) and p value (equal or less than 0.05 was considered statistically significant) would be used for measuring association between B12 level and (nutritional status, physical performance and disabilities) among elderly peoples.

Proposed budget: No funded sponsors.

4. Results



As shown in figure 1, the percentage of B12 deficiency was 35% among old age participants.



The figure above explains the prevalence of nutritional status according to mini nutritional risk assessment.

A total of 100 old age participants (58 men and 42 women) had been included in this study. The mean age was 69.59 ± 6.59 years. Sociodemographic characteristics as explained in table 1.

		Frequency	Percentage
Gender	male	58	58.0
	female	42	42.0
Marital status	married	80	80.0
	divorced	2	2.0
	single	2	2.0
	widow	15	15.0
	separated	1	1.0
	illiterate	5	5.0
Schooling	basic education	52	52.0
	high school	40	40.0
	higher education	3	3.0
working	currently work	14	14.0
	retired	28	28.0
	none	58	58.0
Smoking	non smoker	61	61.0
	ex-smoker	25	25.0
	current smoker	14	14.0
Alcoholism	never	96	96.0
	ex-consumer	4	4.0
Morbidities	no	6	6.0
	one or more morbidities	94	94.0
Dietary	normal	83	83.0
	vegetarian	17	17.0
Gastrointestinal surgery	yes	2	2.0
	no	98	98.0
Intestinal diseases	yes	3	3.0
	no	97	97.0
Drugs	no drug intake	6	6.0
	one or more drug intake	94	94.0
BMI	normal (18.5-24.9)	45	45.0
	over weight (25-29.9)	47	47.0
	obesity (30-34.9)	8	8.0
B12 level	less than normal	35	35.0
	normal	53	53.0
	more than normal	12	12.0
Total		100	100

B12level	Physical performance				Total	Chi square	P value
	0-3 severe limitation	4-6 moderate limitation	7-9 mild limitation	10-12 minimal limitation			
less than normal	2 2.0%	9 9.0%	16 16.0%	8 8.0%	35 35.0%	25.979	0.000
normal	0 0.0%	6 6.0%	17 17.0%	30 30.0%	53 53.0%		
more than normal	0 0.0%	0 0.0%	0 0.0%	12 12.0%	12 12.0%		
Total	2 2.0%	15 15.0%	33 33.0%	50 50.0%	100 100.0%		

Table above shows significant association between B12 level and different degrees of limitation in physical performance.

B12level	Basic activity of daily living (BADLs)		Total	Chi square	P value
	dependent-the elderly presented one or more difficulties	independent-the elderly had no difficulties in performing any task			
less than normal	2 2.0%	33 33.0%	35 35.0%	3.790	0.150
normal	0 0.0%	53 53.0%	53 53.0%		
more than normal	0 0.0%	12 12.0%	12 12.0%		
Total	2 2.0%	98 98.0%	100 100.0%		

No association between B12 level and physical activities of daily living as shown in table 4.

Table (4) Association between B12 level and instrumental activities of daily living among elderly people.

B12level	Instrumental activity of daily living (IADLs)		Total	Chi square	P value
	dependent difficulty performing one or more tasks	independent-no difficulty to perform any task			
less than normal	19 19.0%	16 16.0%	35 35.0%	30.074	0.000
normal	4 4.0%	49 49.0%	53 53.0%		
more than normal	0 0.0%	12 12.0%	12 12.0%		
Total	23 23.0%	77 77.0%	100 100.0%		

As shown above, there is significant association between B12 level and elderly instrumental activities of their daily livings.

Table (5) Association between nutritional status and physical performance in elderly.

Nutritional status	Physical performance				Total	Chi square	P value
	0-3 severe limitation	4-6 moderate limitation	7-9 mild limitation	10-12 minimal limitation			
normal nutritional status 24-30	0 0.0%	0 0.0%	9 9.0%	37 37.0%	46 46.0%	55.330	0.000
at risk of malnutrition 17-23.5	0 0.0%	9 9.0%	20 20.0%	13 13.0%	42 42.0%		
malnourished less than 17	2 2.0%	6 6.0%	4 4.0%	0 0.0%	12 12.0%		
Total	2 2.0%	15 15.0%	33 33.0%	50 50.0%	100 100.0%		

Table (5) explained significant association between nutritional status and physical performance.

Table (6) Association between nutritional status and basic activity of daily living among elderly people.

Nutritional status	Basic activity of daily living (BADLs)		Total	Chi square	P value
	dependent-the elderly presented one or more difficulties	independent-the elderly had no difficulties in performing any task			
normal nutritional status 24-30	0 0.0%	46 46.0%	46 46.0%	14.966	0.001
at risk of malnutrition 17-23.5	0 0.0%	42 42.0%	42 42.0%		
malnourished less than 17	2 2.0%	10 10.0%	12 12.0%		
Total	2 2.0%	98 98.0%	100 100.0%		

Table above explained significant association between nutritional status and physical performance.

Table (7) Association between nutritional status and instrumental activity of daily living

Nutritional status	Instrumental activity of daily living (IADLs)		Total	Chi square	P value
	dependent difficulty performing one or more tasks	independent-no difficulty to perform any task			
normal nutritional status 24-30	0 0.0%	46 46.0%	46 46.0%	54.156	0.000
at risk of malnutrition 17-23.5	11 11.0%	31 31.0%	42 42.0%		
malnourished less than 17	12 12.0%	0 0.0%	12 12.0%		
Total	23 23.0%	77 77.0%	100 100.0%		

There is significant association between nutritional status and instrumental activity of daily living as seen table above.

5. Discussion

Older people are at high risk of inadequate intake and malnutrition, and the increment in the geriatric population will put a lot of patients at risk. Inadequate intake and malnutrition are associated with a decrease in functional status, poor muscle

functioning, low immunity, low bone mass, anemia, reduced cognition, poor healing, delay surgical recovery and prolong hospitalization⁽⁷⁾. As we know old people had particular risk of cobalamin deficiency. The chief causes among elderly are insufficient absorption due to atrophic gastritis, chronic Helicobacter pylori infection, long term use of proton pump inhibitors, histamine H2 blockers,

chronic alcohol consumption, gastric surgery and pancreatic insufficiency⁽⁸⁾. In the present study of a convenient sample of 100 older Iraqis aged 60 years and older.

The prevalence of B12 deficiency is 35% whereas the prevalence of malnutrition is 12% and those at risk of malnutrition is 42%. Data from some countries across Europe, the data are different depending on the country. The B12 deficiency was noticed in 24% of free living, healthy, older Dutch participants, while Hordaland study reported 5.9% prevalence of B12 deficiency among Norwegian people, in China 12% in men and 7.2% in women included for a nutrition and health survey reported low vitamin level⁽⁹⁾. As we well knew the prevalence of deficiency increase with aging but the real prevalence of deficiency is conflicting due to many limitations which are: 1. The differences among participants included in epidemiological studies, 2. Studies conducted in different ethnicity and age ranges, 3. Consumption of food fortification or not, 4. Presence or absence of comorbid condition, 5. Absence of a gold standard test for measuring, and 6. Different cut-off levels and biomarkers considered by different authors⁽⁹⁾. All included participants have some degree of limitation in physical performance due to aging⁽¹⁰⁾ but those with low B12 level have all degrees of limitation so there is significant association between B12 level and physical performance of elderly people, this agrees with a study done among Korean old aged people in 2020⁽¹¹⁾. About disability, there is no significant association between vitamin level and basic activities of daily living while significant association with instrumental activities of daily living as similar study done in Brazil⁽¹²⁾, the rate of disability in basic activities is 2% may be due to polypharmacy as most people using multiple drugs complain from multiple chronic diseases⁽¹³⁾ or may predict frailty. Frailty is a preclinical or clinical silent stage of disability, characterized by reduced function and a greater chance of becoming dependent in stressful conditions⁽¹⁴⁾.

Regarding nutritional status, there is significant relationship between nutritional status and physical performance, this appears similar to study done in Peru⁽⁶⁾. Studying the association between them find out all participants had been variable degrees of limitation but the limitation worse with decreasing scores of mini nutritional scores (MNA). This continuous deterioration in the health status and body function because of aging process; could be an important determinant for malnutrition among elderly as study done in Iraq⁽⁵⁾. About assessments of disability, our study revealed that mini nutritional scores were associated with decline in activities of daily living. Elderly people who were well nourished had not been suffering from declining in function, poor nutritional scores were associated with poor activities of daily living in institutions and community dwelling elders⁽¹⁵⁾⁽¹⁶⁾⁽¹⁷⁾.

Reference

Danielewicz AL, Barbosa AR, Del Duca GF. Nutritional status, physical performance and functional capacity in an elderly population in southern Brazil. *Revista da Associação Médica Brasileira*. 2014 May; 60:242-8.

A. B. Adepoju, I. O. Olayiwola, O.O. Onabanjo, O.A. Lasode. Nutritional Status and Functional Capacity of Elderly in Selected Communities in Ibadan, Oyo State. (2021) Vol. 42, No. 2

Agarwalla R, Saikia AM, Baruah R. Assessment of the nutritional status of the elderly and its correlates. *Journal of family & community medicine*. 2015 Jan;22(1):39.

Leishear K, Ferrucci L, Lauretani F, Boudreau RM, Studenski SA, Rosano C, Abbate R, Gori AM, Corsi AM, Di Iorio A, Guralnik JM. Vitamin B12 and homocysteine levels and 6-year change in peripheral nerve function and neurological signs. *Journals of Gerontology Series A-Biological Sciences and Medical Sciences*. 2012; 67:537-43.

Najlaa Fawzi Jamil, Alaa A. Salih, Mayasah A. Sadiq, Sarah Hamid Shaker. Assessment of Nutritional Status of Elderly People in Baghdad. *Annals of RSCB* [Internet]. 2021Feb.1 [cited 2022Oct.10];:4457-65. Available from:

<https://www.annalsofrscb.ro/index.php/journal/article/view/586>

Tramontano A, Veronese N, Giantin V, Manzato E, Rodriguez-Hurtado D, Trevisan C, De Zaiacomo F, Sergi G. Nutritional status, physical performance and disability in the elderly of the Peruvian Andes. *Aging clinical and experimental research*. 2016 Dec;28(6):1195-201.

Ahmed T, Haboubi N. Assessment and management of nutrition in older people and its importance to health. *Clinical interventions in aging*. 2010; 5:207.

Wong CW. Vitamin B12 deficiency in the elderly: is it worth screening? *Hong Kong Med J*. 2015;21(2):155-164. doi:10.12809/hkmj144383

Vincenti A, Bertuzzo L, Limitone A, D'Antona G, Cena H. Perspective: Practical Approach to Preventing Subclinical B12 Deficiency in Elderly Population. *Nutrients*. 2021 Jun;13(6):1913.

Ruiz-Montero PJ, Chiva-Bartoll O, Martín-Moya R. Effects of ageing in physical fitness. 2016.

Soh Y, Won CW. Association between frailty and vitamin B12 in the older Korean population. *Medicine (Baltimore)*. 2020;99(43): e22327. doi:10.1097/MD.00000000000022327

Oliveira Martinho K, Araújo Tinôco AL, Queiroz Ribeiro A, Luiz Araújo Tinôco A. PREVALENCE AND FACTORS ASSOCIATED WITH VITAMIN B12 DEFICIENCY IN ELDERLY FROM VIÇOSA/MG, BRASIL. *Nutricion Hospitalaria*. 2015 Nov 1;32(5)

Zgheib E, Ramia E, Hallit S, Boulos C, Salameh P. Factors associated with functional disability among Lebanese elderly living in rural areas: Role of polypharmacy, alcohol consumption, and nutrition-based on the aging and malnutrition in elderly lebanese (AMEL) study. *Journal of epidemiology and global health*. 2018 Dec;8(1-2):82.

Gana W, De Luca A, Debaq C, Poitou F, Poupin P,

Aidoud A, Fougère B. Analysis of the Impact of Selected Vitamins Deficiencies on the Risk of Disability in Older People. *Nutrients*. 2021 Sep 10;13(9):3163.

Deshpande, A., & Ravikumar, B. Nutritional status of elderly and its association with frailty among them. *International Journal of Community Medicine And Public Health*. 2021;9(1), 153-156. doi: <http://dx.doi.org/10.18203/2394-6040.ijcmph20214859>

<https://dx.doi.org/10.18203/2394-6040.ijcmph20214859>

Hai S, Gao Q, Gwee X, Chua DQ, Yap KB, Ng TP. Malnutrition risk, physical function decline and disability in middle-aged and older adults followed up in the Singapore longitudinal ageing study. *Clinical Interventions in Aging*. 2021; 16:1527.

Lin HT, Chang FK, Tsai HJ. The Influence of Exercise, Nutritional Status, and Disease on the Functional Ability to Undertake Activities of Daily Living and Instrumental Activities of Daily Living in Old Taiwanese People. *Applied Sciences*. 2022 Apr 30;12(9):4585.